

Western Digital Technologies, Inc.

Serial Number: 10/080,784

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Patent

Docket: K35A0462

TFW 2651

Inventor Application of:

Michael S. Rothberg

Serial No.: 10/080,784

Filed: 02/22/02

Title: DISK DRIVE EMPLOYING DATA
AVERAGING TECHNIQUES DURING
RETRY OPERATIONS TO FACILITATE
DATA RECOVERY

Group Art Unit: 2651

Examiner: Slavitt, M. R.

PETITION TO WITHDRAW HOLDING OF ABANDONMENT

THE COMMISSIONER FOR PATENTS
ALEXANDRIA, VA 22313

Dear Sir,

A notice of non-compliant amendment was mailed on 05/24/05 for the above-identified patent application for using the incorrect claim identifier "presently amended" rather than the correct claim identifier "currently amended". The applicant mailed a response to the notice on 06/17/05 including the required amendments to the claim identifiers. A copy of the postcard evincing receipt of the response by the USPTO is included herewith.

The applicant mistakenly identified the response using patent application serial number **09/080,784** rather than the correct serial number **10/080,784**. Consequently, the response was not entered into the PALM for the present application, but instead was likely entered into the PALM for the incorrectly identified application (serial number **09/080,784**).

Although the examiner has not yet issued a notice of abandonment, the present application has gone abandoned for failing to reply to the notice of non-compliant amendment within the statutory period.

The applicant respectfully requests that the status of abandonment be withdrawn under MPEP §713.03(c)(B) since a reply to the notice was timely mailed as evinced by

the postcard received from the USPTO (copy included) together with the likely PALM entry for the incorrectly identified application serial number **09/080,784**.

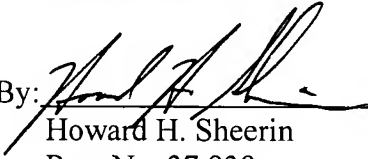
The applicant includes herewith a copy of the response to the notice of non-compliant amendment previously submitted.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 23-1209, and please credit any excess fees to such deposit account.

CONCLUSION

The examiner is encouraged to contact the undersigned over the telephone in order to resolve any remaining issues that may prevent the immediate allowance of the present application.

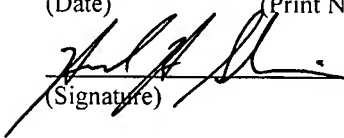
Respectfully submitted,

Date: 1/3/06 By: 
Howard H. Sheerin
Reg. No. 37,938
Tel. No. (303) 765-1689

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on:

1/3/06 Howard H. Sheerin
(Date) (Print Name)


(Signature)



IN THE U.S. PATENT AND TRADEMARK OFFICE

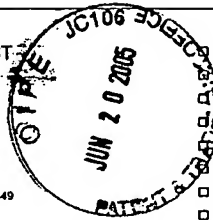
Application No.: 09/080,784 File Reference: K35A0462
Inventor/Applicant: Rothberg Date Due: _____
Title/Mark: Disk Drive Employing Data Averaging Techniques
During Retry Operations to Facilitate Data Recovery

Receipt is hereby acknowledged of the following:

- Response to Notice of Non-Compliant Amendment

☐ Patent Application (No. pgs _____) ☐ PCT
☐ Trademark Application ☐ Intent to Use
☐ Drawings _____ Sheets/Specimens
☐ Declaration and Power of Attorney
☐ Assignment w/Cover Sheet
☐ Power of Attorney
☐ Information Disclosure Statement w/PTO 1449
☐ Resp. to Notice to File Missing Parts
☐ _____ Transmittal

☐ Petition for Extension of Time
☐ Response/Amendment
☐ Issue Fee Transmittal
☐ Submission of Formal Drawings
☐ PCT Request & Fee Sheet
☐ PCT Chapter II Demand & Fee Sheet
☐ PCT Response
☐ Express Mail Certificate
☒ Certificate of Mailing



Express Mail label No.: _____ Date Mailed: 6/17/05



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Western Digital Technologies, Inc.
Serial Number: 09/080,784

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Patent
Docket: K35A0462

In Application of:
Michael S. Rothberg
Serial No.: 09/080,784
Filed: 02/22/02
Title: DISK DRIVE EMPLOYING DATA
AVERAGING TECHNIQUES DURING
RETRY OPERATIONS TO FACILITATE
DATA RECOVERY

Group Art Unit: 2651
Examiner: Slavitt, M. R.

RESPONSE TO NOTICE OF NON-COMPLIANT AMENDMENT

THE COMMISSIONER FOR PATENTS
ALEXANDRIA, VA 22313

Dear Sir,

A notice of non-compliant amendment was mailed on 05/24/05 for the above-identified patent application which objected to the claim status identifier of "presently amended". Accordingly, please enter the following correction to the amended claims:

In the Claims:

1 Please cancel, without prejudice, claims 2, 6, 7, 15, 19 and 20.

2 Please amend the remaining claims as follows:

3 1. (currently amended) A disk drive comprising:

4 (a) a disk comprising a plurality of tracks, each track comprising a plurality of data
5 sectors;

6 (b) a head actuated radially over the disk, the head for generating a read signal while
7 reading data from at least one of the data sectors;

8 (c) a sampling device for sampling the read signal to generate read signal sample values;

9 (d) a sequence detector for detecting an estimated data sequence from the read signal
10 sample values;

11 ~~(e)(e) a buffer for buffering read data associated with the read signal;~~

12 ~~(e)(f) a disk controller for processing a read command received from a host computer by:~~

13 positioning the head over a selected data sector to generate a first read signal;

14 sampling the first read signal to generate a first sequence of read signal sample
15 values;

16 detecting a first estimated data sequence using the sequence detector from the first
17 sequence of read signal sample values;

18 ~~storing in the buffer first read data associated with the first read signal~~ the first
19 estimated data sequence;

20 if a read error occurs:

21 repositioning the head over the selected data sector to generate a second read
22 signal;

23 sampling the second read signal to generate a second sequence of read signal
24 sample values;

25 detecting a second estimated data sequence using the sequence detector from the
26 second sequence of read signal sample values;

27 ~~averaging second read data associated with the second read signal~~the second
28 estimated data sequence with the first read dataestimated data sequence stored
29 in the buffer to generate an averaged estimated data sequence ~~read data~~;
30 storing the averaged ~~read data~~estimated data sequence in the buffer; and
31 processing the averaged ~~read data~~estimated data sequence stored in the buffer to
32 recover the selected data sector.

1 2. (canceled)

1 3. (currently amended) The disk drive as recited in ~~claim 2~~claim 1, wherein the disk
2 controller implements an error correction code (ECC) for detecting and correcting errors
3 in the averaged ~~binary bits~~estimated data sequence.

1 4. (currently amended) The disk drive as recited in claim 3, wherein:
2 (a) the averaged estimated data sequence comprises averaged binary bits;
3 ~~(a)~~(b) the averaged binary bits are grouped into ECC symbols;
4 ~~(b)~~(c) a reliability metric is generated for each ECC symbol in response to a reliability
5 derived from averaging the binary bits; and
6 ~~(c)~~(d) the disk controller processes the reliability metrics to augment the ECC.

1 5. (original) The disk drive as recited in claim 4, wherein:
2 (a) at least one erasure pointer is generated from the reliability metrics; and
3 (b) the disk controller processes the erasure pointer to increase the number of correctable
4 ECC symbols.

1 6. (canceled)

1 7. (canceled)

1 8. (currently amended) The disk drive as recited in ~~claim 7~~claim 1, ~~wherein the read channel~~
2 ~~comprises~~further comprising:
3 ~~(a) an equalizer filter for filtering the averaged read signal sample values to generated~~
4 generate equalized read signal sample values, wherein the sequence detector detects the
5 estimated data sequences from the equalized sample values.; and
6 ~~(b) a sequence detector for detecting the estimated data sequence from the equalized read~~
7 ~~signal sample values.~~

1 9. (original) The disk drive as recited in claim 1, wherein the disk controller adjusts at least
2 one parameter of the disk drive prior to rereading the selected data sector.

1 10. (original) The disk drive as recited in claim 9, wherein the disk controller adjusts a read
2 channel parameter.

1 11. (original) The disk drive as recited in claim 9, wherein the disk controller adjusts a servo
2 control parameter.

1 12. (original) The disk drive as recited in claim 11, wherein the disk controller adjusts a
2 tracking offset to at least two different settings wherein for each tracking offset setting
3 the disk controller performs at least one reread of the selected data sector to generate the
4 averaged read data.

1 13. (original) The disk drive as recited in claim 12, wherein for each tracking offset setting
2 the disk controller performs multiple rereads of the selected data sector to generate the
3 averaged read data.

1 14. (currently amended) A method of recovering an errant data sector in a disk drive, the disk
2 drive comprising a disk having a plurality of tracks, each track comprising a plurality of
3 data sectors, a head actuated radially over the disk, the head for generating a read signal
4 while reading data from at least one of the data sectors, a sampling device for sampling
5 the read signal to generate read signal sample values, a sequence detector for detecting an
6 estimated data sequence from the read signal sample values, and a buffer for buffering
7 ~~read data associated with the read signal~~, the method comprising the steps of:

8 (a) receiving a read command from a host computer;

9 (b) positioning the head over a selected data sector to generate a first read signal;

10 (c) sampling the first read signal to generate a first sequence of read signal sample
11 values;

12 (d) detecting a first estimated data sequence using the sequence detector from the first
13 sequence of read signal sample values;

14 (e)(e) storing in the buffer the first estimated data sequence ~~first read data associated~~
15 ~~with the first read signal~~;

16 if a read error occurs:

17 (d)(f) repositioning the head over the selected data sector to generate a second read
18 signal;

19 (g) sampling the second read signal to generate a second sequence of read signal
20 sample values;

21 (h) detecting a second estimated data sequence using the sequence detector from the
22 second sequence of read signal sample values;

23 (e)(i) averaging the second estimated data sequence ~~second read data associated with~~
24 ~~the second read signal~~ with the first read data estimated data sequence stored in the
25 buffer to generate an averaged read data estimated data sequence;

26 (f)(j) storing the averaged read data estimated data sequence in the buffer; and

27 ~~(g)(k)~~ processing the averaged ~~read data~~ estimated data sequence stored in the buffer
28 to recover the selected data sector.

1 15. (canceled)

1 16. (currently amended) The method as recited in ~~claim 15~~ claim 14, further
2 ~~comprising~~ wherein the step of processing the averaged estimated data sequence
3 comprises the step of using an error correction code (ECC) for detecting and correcting
4 errors in the averaged ~~binary bits~~ estimated data sequence.

1 17. (currently amended) The method as recited in claim 16, wherein the averaged estimated
2 data sequence comprises averaged binary bits, and the step of using the ECC for
3 detecting and correcting errors further comprising the steps of:
4 (a) grouping the averaged binary bits into ECC symbols;
5 (b) generating a reliability metric for each ECC symbol in response to a reliability
6 derived from averaging the binary bits; and
7 (c) processing the reliability metrics to detect and correct errors in the averaged
8 binary data.

1 18. (original) The method as recited in claim 17, further comprising the steps of:
2 (a) generating at least one erasure from the reliability metrics; and
3 (b) processing the erasure pointer to increase the number of correctable ECC
4 symbols.

1 19. (canceled)

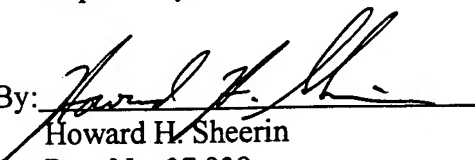
1 20. (canceled)

- 1 21. (currently amended) The method as recited in ~~claim 20~~claim 14, further comprising the
2 steps of:
- 3 (a) ~~filtering the averaged read signal sample values to generated equalized read signal~~
4 ~~sample values, wherein the sequence detector detects the estimated data sequences~~
5 ~~from the equalized sample values;~~ and
6 (b) ~~detecting the estimated data sequence from the equalized read signal sample~~
7 ~~values.~~
- 1 22. (original) The method as recited in claim 14, further comprising the step of adjusting at
2 least one parameter of the disk drive prior to rereading the selected data sector.
- 1 23. (original) The method as recited in claim 22, wherein the step of adjusting a parameter of
2 the disk drive comprises the step of adjusting a read channel parameter.
- 1 24. (original) The method as recited in claim 22, wherein the step of adjusting a parameter of
2 the disk drive comprises the step of adjusting a servo control parameter.
- 1 25. (original) The method as recited in claim 24, further comprising the steps of adjusting a
2 tracking offset to at least two different settings wherein for each tracking offset setting
3 rereading the selected data sector at least once to generate the averaged read data.
- 1 26. (original) The method as recited in claim 25, wherein for each tracking offset setting
2 rereading the selected data sector multiple times to generate the averaged read data.

CONCLUSION

The examiner is encouraged to contact the undersigned over the telephone in order to resolve any remaining issues that may prevent the immediate allowance of the present application.

Respectfully submitted,

Date: 6/17/05 By: 
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Tel. No. (303) 765-1689

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on:

6/17/05 Howard H. Sheerin
(Date) (Print Name)


(Signature)